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T-41-39

LM020L
LM020LN (EL Backlit Version)

- 16 character x 1 line
- Controller LSI HD44780 is built-in (See page 115).
- +5V single power supply

MECHANICAL DATA (Nominal dimensions)

Module size . . . . 80W x 36H x 12T (max.) mm
Effective display area . . . . 64.5W x 13.8H mm
Character size (5 x 7 dots) . . . . 3.07W x 5.73H mm
Characrer pitch . . . . 3.77 mm
Dot size . . . . 0.55W x 0.75H mm
Weight . . . . about 25 g

ABSOLUTE MAXIMUM RATINGS   min.   max.

Power supply for logic ($V_{DD}-V_{SS}$) 0   7.0 V
Power supply for LCD drive ($V_{DD}-V_O$) 0   13.5 V
Input voltage (Vi) . . . . V_{SS} V_{DD} V
Operating temperature (Ta) 0   50°C
Storage temperature (Tstg) . . . . −20   70°C
EL Power Supply (when fitted)
    Voltage (VEL) . . . . AC 150 Vms
    Frequency (fEL) (at 100 Vms) 1kHz

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

Input "high" voltage (Vi_H) . . . . 2.2 V min.
Input "low" voltage (Vi_L) . . . . 0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$ = 0.2 mA) . 2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA) . . . 0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V) . . 1.0 mA typ.
                                         2.0 mA max.
Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)
                                       Duty = 1/16
Range of $V_{DD}-V_O$ . . . . 1.5~5.25 V
    Ta = 0°C . . . . 4.6 V typ.
    Ta = 25°C . . . . 4.4 V typ.
    Ta = 50°C . . . . 4.2 V typ.
Power Supply for EL (when fitted)
    VEL (typ. at 400Mz) . . . . 100 Vms
    fEL (max at VEL 100V, fEL 400Hz) 9.5mA

OPTICAL DATA . . . . See page 5.

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	−	0V	
2	V_{DD}	−	+5V	Power supply
3	V_O	−	−	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L		
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L	Data bus line Note (1), (2)	
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Luminescent output of EL (where fitted) at Ø = 25°C, Ø = 0°C - 6cd / m² typ.

Notes:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.
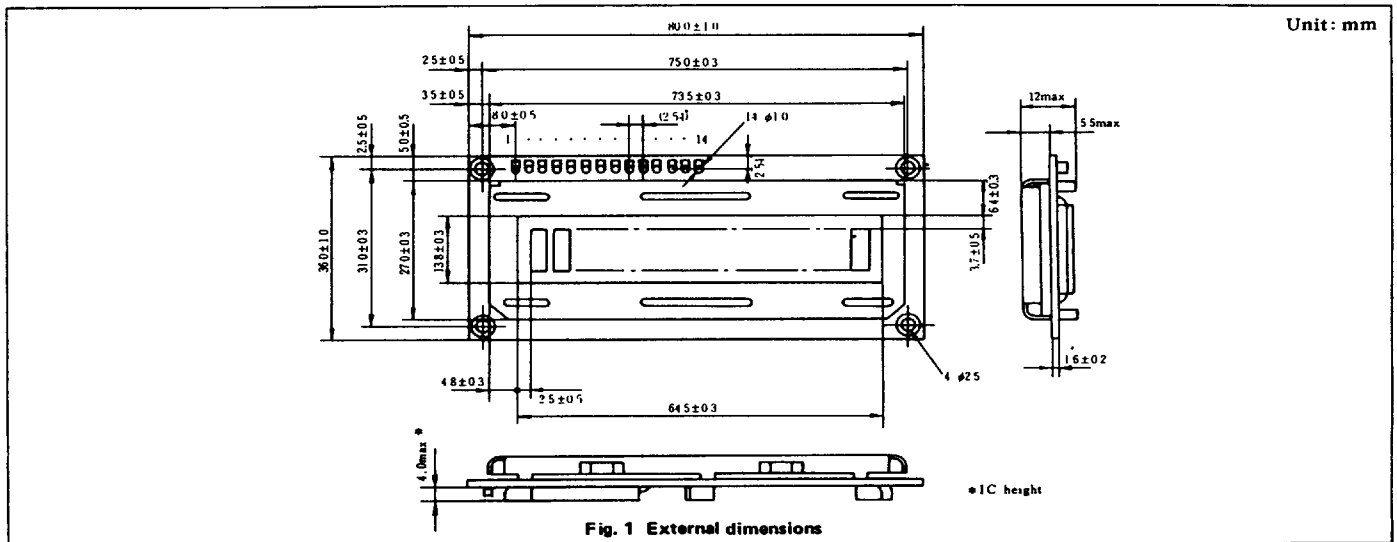
(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.

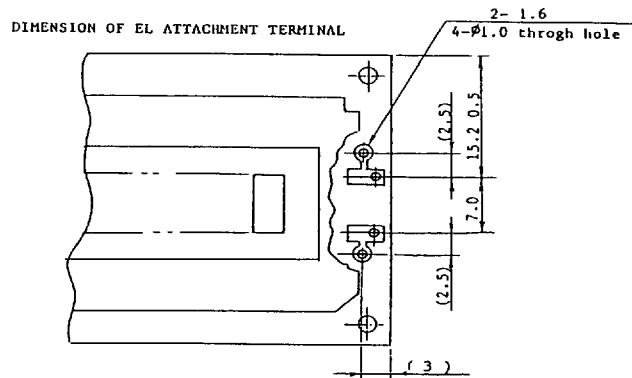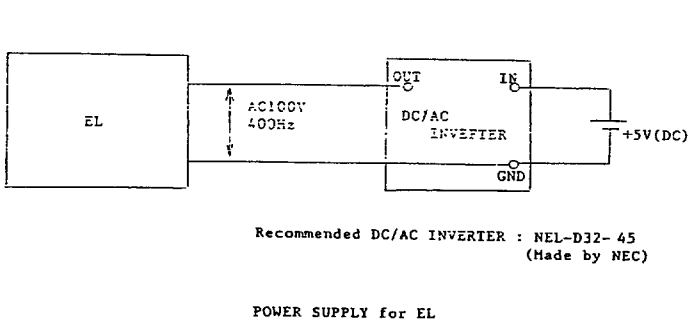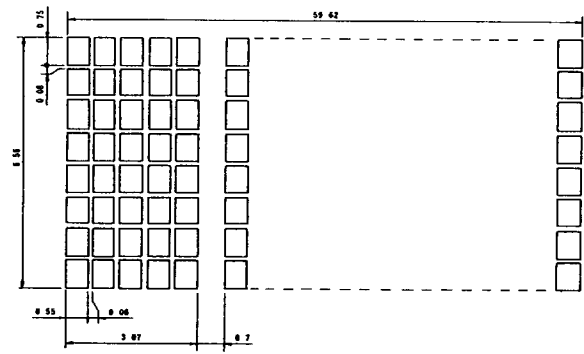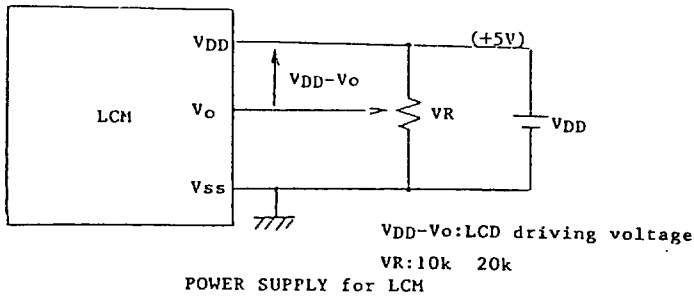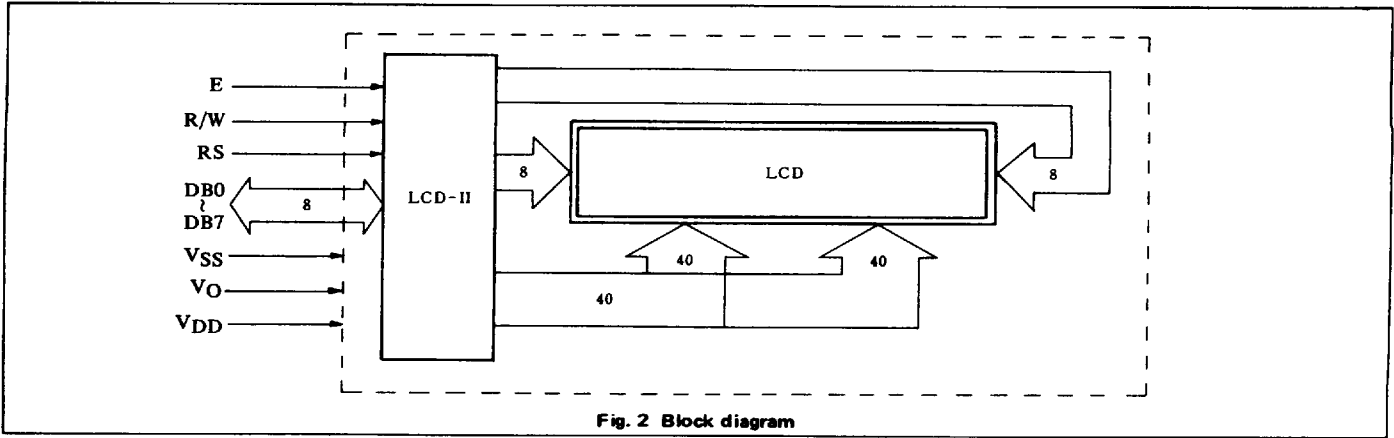## DRIVING INFORMATION

To reduce component count, this module is configured as a 2 line of 8 character display but with these organised to visually appear as 1 line of 16 characters.

The consequences are :

1) on power up this must be configured as 2 line display
2) character address not continuous 0 - 7 address is 00HEX - 07HEX, 8 - 15 address is 40HEX - 47HEX

Fig. 1 External dimensions

Unit: mm

Fig. 2 Block diagram

$V_{DD}-V_o$:LCD driving voltage

VR:10k 20k

POWER SUPPLY for LCM

DIMENSION OF EL ATTACHMENT TERMINAL

Recommended DC/AC INVERTER : NEL-D32-45
                                (Made by NEC)

POWER SUPPLY for EL

TIMING CHARACTERISTICS

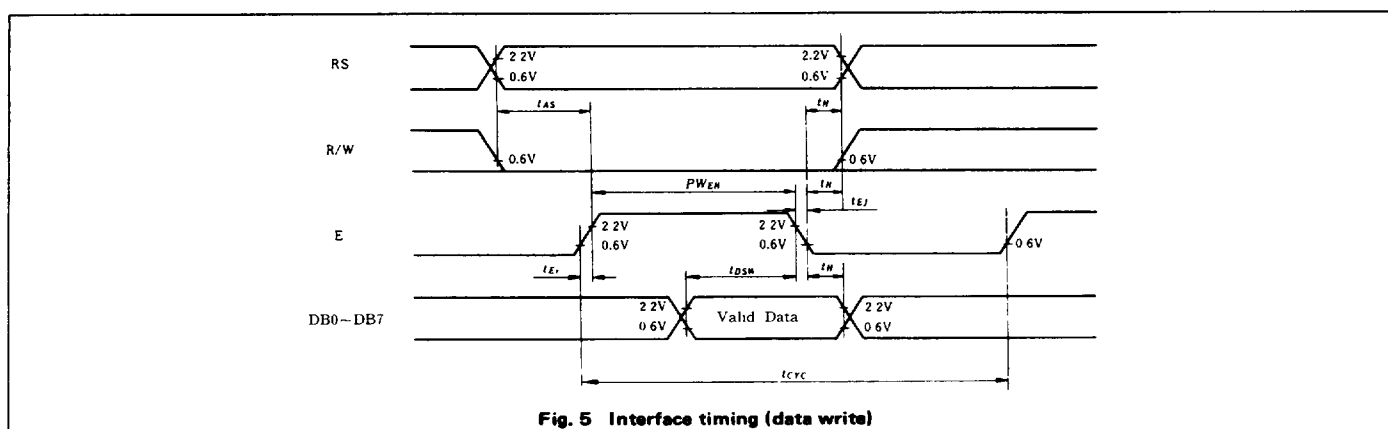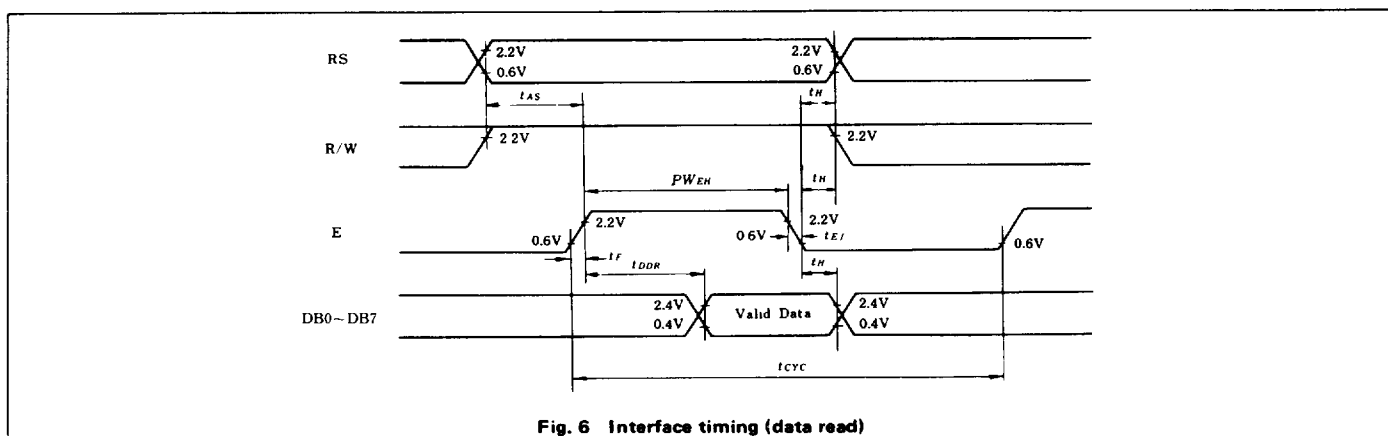| Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	—	—	μs
Enable pulse width	PW_{EH}	Fig. 5, Fig. 6	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	—	—	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	—	—	ns
Data delay time	t_{DDR}	Fig. 6	—	—	320	ns
Data set up time	t_{DSW}	Fig. 5	195	—	—	ns
Hold time	t_H	Fig. 5, Fig. 6	20	—	—	ns

Fig. 5   Interface timing (data write)

Fig. 6   Interface timing (data read)